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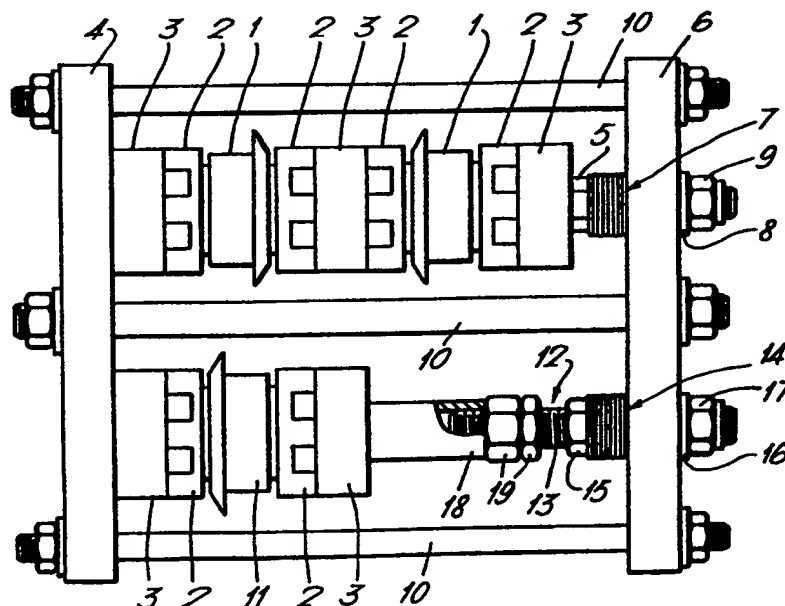
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(56) Documents cited  
GB 0640212 A GB 0496797 A GB 0381555 A

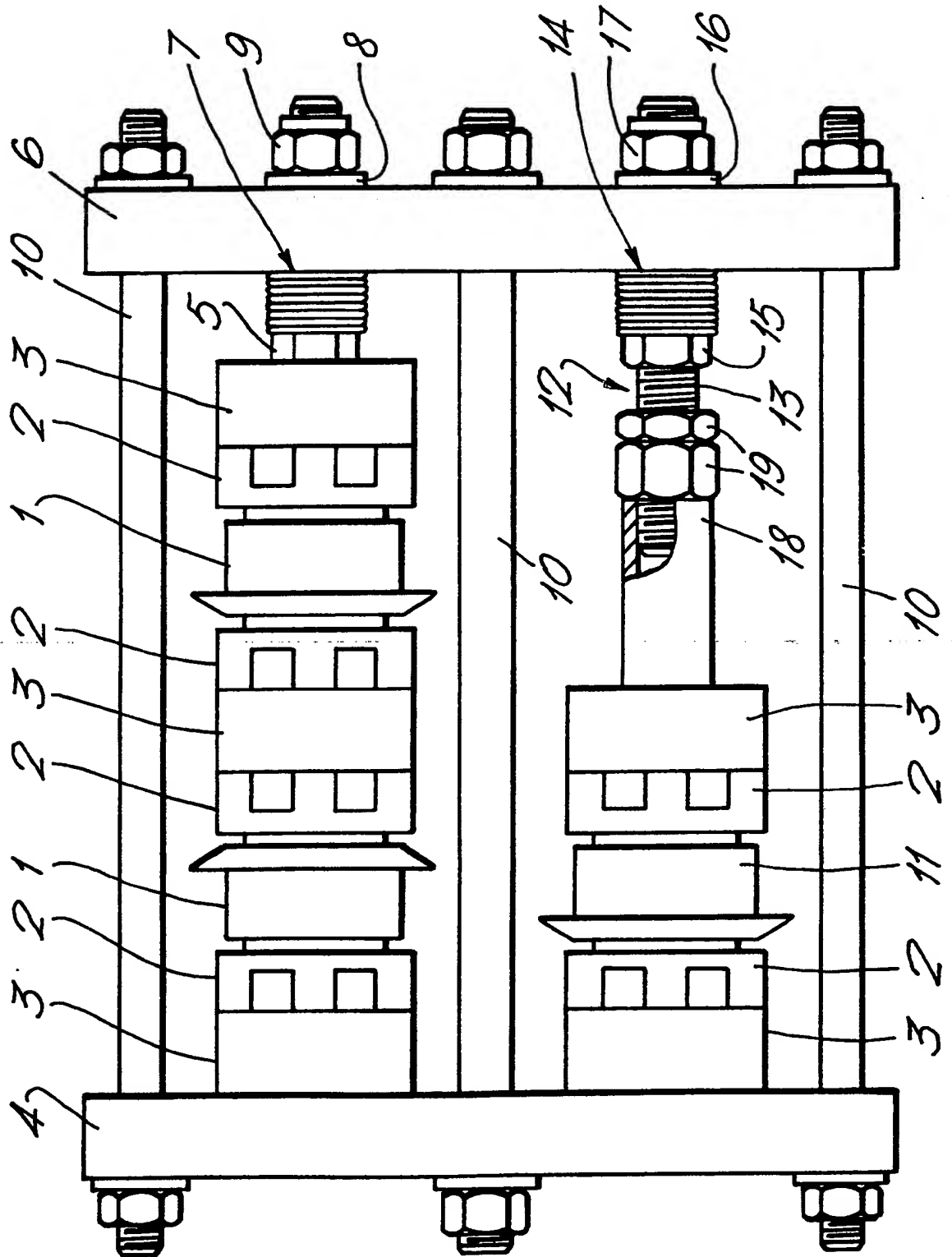
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## (54) Mounting arrangements for electronic components

(57) In a mounting arrangement for power semiconductor devices in which devices (1) and heat sinks (2) are clamped in two or more linear stacks in a common frame, at least one of the stacks includes means to adjust the clamping pressure in that stack individually.



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SCC/3421Mounting arrangements for electrical components

The present invention relates to mounting arrangements for electrical components.

In particular, although not exclusively, the invention is concerned with mounting arrangements for high power semiconductor devices such as transistors, diodes and thyristors. It is often required to mount such devices so as to ensure good electrical and/or thermal contact between devices, or between devices and electrodes or heat sinks where permanent bonding, for example by soldering or welding, is impractical, either because of the nature of the devices or because it may be necessary to replace devices from time to time.

In such mounting arrangements it is important to apply sufficient pressure both between devices and electrodes, since considerable amounts of heat can be generated at poor interfaces, and between devices and heat sinks in order to dissipate the heat generated within the devices in operation. At the same time too high a pressure can mechanically damage some devices, and for many devices the correct clamping pressure is crucial to satisfactory operation.

In presently known mounting arrangements a number of

devices may be arranged in a linear stack with electrodes, insulators and/or heat sinks positioned between them as necessary, with the clamping pressure applied by means of tie rods extending between end frame members. In such arrangements the same pressure is necessarily applied to all devices in the stack.

According to one aspect of the present invention in a mounting arrangement in which a plurality of components or devices are clamped to form a unitary structure, said components or devices are arranged in at least two substantially linear stacks between common end frames, and at least one of said linear stacks includes means individually to adjust the clamping pressure applied to said one stack between said end frames.

According to another aspect of the present invention an assembly of high power semiconductor devices comprises at least a first semiconductor device and one or more electrodes, insulators or heat sinks disposed in a first stack between a pair of end frame members and means to secure said end frames together whereby clamping pressure may be applied to said first stack, and at least a second semiconductor device and one or more electrodes, insulators or heat sinks disposed between said end frame members in a second stack including means individually to adjust the clamping pressure applied to said second stack between said end frame members.

Preferably said first stack also includes means individually to adjust the clamping pressure applied to said first stack.

A mounting arrangement in accordance with the present invention will now be described by way of example with reference to the accompanying drawing, which shows the arrangement schematically in elevation.

Referring to the drawing two high-power semiconductor devices 1, each sandwiched between a respective pair of heat sinks 2, are arranged in a first linear array or stack with electrical insulators 3 between adjacent heat sinks 2 and at either end of the

stack. The stack is clamped between a first end frame member 4 and the head of a bolt 5 secured to a second end frame member 6. The bolt 5 secures a dished washer assembly 7 against the frame member 6, and an indicator washer 8 is secured under a securing nut 9. The end frame members 4 and 6 are held in position by means of tie bolts 10.

A third semiconductor device 11 is sandwiched between a respective pair of heat sinks 2 and is arranged in a second stack with respective insulators 3 between the end frame member 4 and a spacer assembly 12, the spacer assembly 12 comprising a threaded rod 13 on which a dished washer assembly 14 is secured against the frame member 6, by means of a nut 15, and an indicator washer 16 is secured by means of a nut 17. The threaded rod 13 extends within a tubular member 18 which bears against the adjacent insulator 3, and the effective length of the spacer assembly 12 is set by means of a pair of nuts 19.

The dished washer assemblies 7 and 14 are preset to required loads with the respective indicator washers 8 and 16 captive, and when the first stack is clamped the tie bolts 10 are tightened until the preset load on the dished washer assembly 7 is reached, whereupon the indicator washer 8 is released. The nuts 19 of the spacer assembly 12 may then be adjusted until the preset load on the dished washer assembly 14 is reached and the indicator washer 16 released.

As described above the device 11 in the second stack may be replaced without dismantling the whole mounting arrangement. If both stacks included spacer assemblies 12 then clearly devices in either stack could be replaced without dismantling the whole arrangement. In the latter case the end frames 4 and 6 and the tie bolts 10 may be replaced by a frame of fixed dimensions (not shown) since the necessary loading of the stacks may be achieved by means of the individual spacer assemblies.

It will be appreciated that the preset loads for the two stacks may be of equal or unequal length, so that differences in

device thicknesses due to manufacturing tolerances may be accommodated.

CLAIMS

1. A mounting arrangement in which a plurality of components or devices are clamped to form a unitary structure, wherein said components or devices are arranged in at least two substantially linear stacks between common end frames, and at least one of said linear stacks includes means individually to adjust the clamping pressure applied to said one stack between said end frames.
2. An assembly of high power semiconductor devices comprising at least a first semiconductor device and one or more electrodes, insulators or heat sinks disposed in a first stack between a pair of end frame members and means to secure said end frames together whereby clamping pressure may be applied to said first stack, and at least a second semiconductor device and one or more electrodes, insulators or heat sinks disposed between said end frame members in a second stack including means individually to adjust the clamping pressure applied to said second stack between said end frame members.
3. An assembly in accordance with Claim 2 wherein said first stack also includes means individually to adjust the clamping pressure applied to said first stack.
4. A mounting arrangement substantially as hereinbefore described with reference to the accompanying drawing.